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AUTHOR Horton, Phillip B.
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ABSTRACT

Seventeen selected research studies relating student learning with teacher characteristics and personality in grades 7-12 science classrooms are reviewed. Methodology, objectives, and major findings of the 1960 "Teacher Characteristics Study" and short summaries of nine additional studies are considered in the first section dealing with general studies on the topic. Seven studies reviewed in the second section focus on individualized science programs in general and the Intermediate Science Curriculum Study (ISCS) in particular. It is concluded that: (1) very little is known for certain about the relationships between teacher characteristics and personality, and teacher effectiveness in the classroom; (2) since the literature indicates that teachers who have received special training in conducting individualized science instruction will be more effective in facilitating student learning, science teacher training programs should include experiences with this instructional strategy; and (3) further research is needed to investigate relationships between teacher factors and student variables other than achievement. (Author/JN)

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THE ROLE OF TEACHER CHARACTERISTICS AND PERSONALITY IN STUDENT LEARNING IN INDIVIDUALIZED SCIENCE PROGRAMS

Phillip B. Horton, Ph.D.

Assistant Professor of Science Education

Florida Institute of Technology

Melbourne, Florida 32901

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THE ROLE OF TEACHER CHARACTERISTICS AND PERSONALITY IN STUDENT LEARNING IN INDIVIDUALIZED SCIENCE PROGRAMS

Science teachers differ considerably with respect to training, teaching experience, personality and values. Most educators readily admit that the teacher is an important factor in the classroom, regardless of the strategy, methodology or text materials employed. Nevertheless, there is not a large amount of relevant research on this important subject.

Most studies which discuss teacher characteristics as a possible factor in their results do so only in general terms and usually do not give enough information to be worthwhile. Additionally, many studies that are concerned with teacher characteristics usually do not distinguish between subject matter taught, hence the information reported may or may not be applicable to science teachers.

Another problem area with studies about teacher characteristics involves the criteria used to determine teacher effectiveness. Ratings by supervisors have been frequently used for this purpose. These ratings tend to be unreliable, however, since not everyone is agreed as to what constitutes an effective teacher. Other researchers have suggested pupil gain as a less subjective criteria though there are also problems with this approach. Despite the shortcomings involved, pupil gain would appear to be the most useful criterion for measuring teacher effectiveness. Therefore, this paper will attempt to survey the relevant research relating student learning with teacher characteristics and personality in science classrooms, 7-12.

General Studies

The Teacher Characteristics Study (Ryans, 1960) is the single most extensive study of teacher characteristics to date. Three main objectives were reported for this study: (1) the identification and analysis of some patterns of classroom behavior, attitudes, viewpoints, and intellectual and emotional qualities which may characterize teachers; (2) the development of paper-and-pencil instruments suitable for the estimation of certain patterns of classroom behavior and personal qualities of teachers; (3) the comparison of various groups of teachers. It was felt that this information would aid school systems in identifying teachers with characteristics deemed important and desirable by the school system and the culture it represents. Additionally, teacher education institutions might use the information to improve procedures for selecting teacher candidates and to improve professional courses and curricula (Ryans, 1960).

During the more than six years of this study, more than 6,000 teachers in 1,700 schools participated. Classroom observation by trained observers as well as paper-and-pencil inventories were used to gain the information reported. Some of the relevant findings of this study included:

(1) Age and Experience. Generally, the older and the more experienced teachers were rated as less effective.

(2) Sex. Women teachers were generally rated higher than men teachers though men teachers were reported as higher in emotional stability.

(3) Marital Status. There were no systematic differences reported for teachers of different marital status.

(4) Undergraduate College and Academic Achievement. Although few important differences were found for this variable, teachers from large universities were seen as slightly more effective.

(5) Teacher Characteristics in Relation to Size of School, Size of Community, Socioeconomic Status of Community, Geographic Area in Which Teaching is Performed. Results generally favored teachers from larger schools and larger communities as well as areas of higher socioeconomic status.

(6) Characteristics of Teachers Assessed as Generally High and Generally Low in Effectiveness. There was a general tendency for high-rated teachers to: possess strong interest in reading and literary affairs; be interested in music, painting and the arts in general; participate in social relationships; enjoy pupil relationships; prefer nondirective classroom procedures; manifest superior verbal intelligence; and be superior with respect to emotional adjustment. On the other hand, low-rated teachers tended generally to: express less favorable opinions of pupils; manifest less high verbal intelligence; show less satisfactory emotional adjustment; and represent older age groups. (Ryans, 1960)

Although this study presented a wealth of useful information about teachers in general, not enough specific data was reported to allow conclusions to be drawn about the role of teacher characteristics in science classrooms.

A study by Taylor (1959) which dealt specifically with science teachers found no significant relationships between changes in student interests and achievement in high school science and teacher attitudes toward teaching, teacher preparation in science and years of teaching experience. Studies by Disinger (1971) and Ahlgren (1970) similarly found no significant relationships between teacher characteristics and the science learning of the students in their studies.

Yager (1966) however, has reported significant teacher effects on the outcomes of science instruction in his study. His conclusions were:

> (1) the individual teacher affects the degree of content achievement of students as measured by a standardized instrument.
>
> (2) the individual teacher affects the growth of specific skills in science such as critical thinking.
>
> (3) the teacher affects student attitude.
>
> (4) although professional preparation and stated philosophy are similar, teachers have varied abilities to make a course interesting to students. (Yager, 1966)

Another study by Welch and Wahlberg (1969) involved teachers using Project Physics. They reported a strong relationship between teacher personalities and value systems and student change in physics achievement, attitude toward physics and interest in science. Teaching experience, teacher training in math and physics and knowledge of the history and philosophy of science were not significantly related to student growth.

In a different type of study, Wilson and Garibaldi (1976) found significantly positive achievement test differences for students of teachers who had participated in NSF sponsored institutes. These researchers also reported similar findings by Hegelson (1974) and other researchers. Thelen and Litsky (1972) reported significantly higher post-test means for students of teachers who attended a NSF sponsored water pollution control institute as compared to students whose teachers did not attend the institute.

An interesting study by Tamppari and Johnson (1975) includes ranked characteristics of employable science teachers as perceived by school district hiring officials in the southwest.

Individualized Science Studies

Individualized science programs are designed to release the classroom teacher from the authoritarian role of lecturer, demonstrator and central classroom figure. The Intermediate Science Curriculum Study (ISCS) is one of the most widely studied individualized science programs and most of the research found in this section is concerned with that program. In the ISCS classroom, the teacher is supposed to become a resource person who interacts intimately with each student. Some of the recommended behaviors for classroom teachers in this program are:

> (1) behaviors characteristic of the individualized setting (provides remedial instruction in a tutorial mode and supervises and assists pupils in self-evaluation activities);
>
> (2) indirect behaviors (asks questions);
>
> (3) nonverbal activities rather than sitting alone at desk or preparing equipment;
>
> (4) instructional behaviors (interacts with pupils to clarify and/or expand their understanding of concepts and/or procedures rather than to discipline or to deal with classroom routines). (Clark, 1975)

Due to the unique nature of the individualized setting and the new roles and behaviors required of teachers, it is logical to assume that the effects of teacher personality and characteristics will not be the same

as for other non-individualized programs. Consequently, studies relating teacher personality and characteristics to student learning in individualized science classrooms will be reviewed in this section.

One study reported finding no relationship between the teacher factor and student learning. Dodson and Lewis (1973) compared achievement test scores of students taught by new ISCS teachers with scores of students taught by master ISCS teachers. They found no significant differences between the means of these groups. However, the other studies reported in this section all reported finding statistically significant relationships between student performance and the teacher variable studied.

Nieft (1972) and Nieft and Lashier (1975) found a positive correlation between teacher warmth and student growth in achievement and attitudes toward science. They did not find a significant relationship between student achievement and attitudes and the teacher variables of demand and intrinsic motivation.

Clark (1975) reported a significant positive relationship between student performance in ISCS Level I and teacher cognitive characteristics, especially knowledge of the processes of science and knowledge of the content of ISCS. Clark also reported significant relationships between student achievement and the extent to which teachers practiced the ISCS recommended classroom behaviors mentioned previously. Similar findings were reported by Powell (1974) who found that teachers exhibiting the model ISCS behaviors performed best. Powell also reported a "predictable" effect between teacher personality traits and success in teaching ISCS.

Jenson (1974) investigated the relationship between special training in the methods of teaching ISCS and subsequent teacher performance. The author concluded from the study that teachers who have received special

training (institute, ITP, etc.) can conduct ISCS classrooms better than those who have not received special training.

Finally, the most exhaustive study done on teacher characteristics in individualized science classrooms to date was by Snyder and Kellogg (1970). 83 teachers who were participating in the ISCS field trial evaluations were used in the study. The researchers concluded that experienced ISCS teachers were significantly more effective as measured by student achievement than non-experienced teachers. Other teacher characteristics such as grade level taught, highest degree earned, total number of science hours, and total number of physical science hours were reported as non-significant factors in the ISCS classrooms used in these studies.

Summary and Recommendations

Despite the critical importance of the problem, very little is known for certain about the relationship between teacher characteristics and personality, and teacher effectiveness in the science classroom. Many studies have reported nonsignificant findings perhaps due to low statistical power or the use of improper student measures. There seems to be, however, reasonably consistent agreement in the literature that experienced teachers and teachers who have received special training in the conduct of individualized science instruction will be more effective in facilitating student learning. Consequently, science teacher training programs should include exposure to actual classroom situations and special training in the methodology and rationale of individualized instruction.

Further research is needed to investigate the relationships between teacher factors and student variables other than achievement. Watson (1963)

has suggested that other student cognitive measures plus affective and psychomotor domain variables should be investigated. He attributes many of the nonsignificant findings to the narrow use of achievement test scores only. Perhaps future studies that include other measures will shed additional light on the role of teacher characteristics and personality in the individualized science classroom.

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